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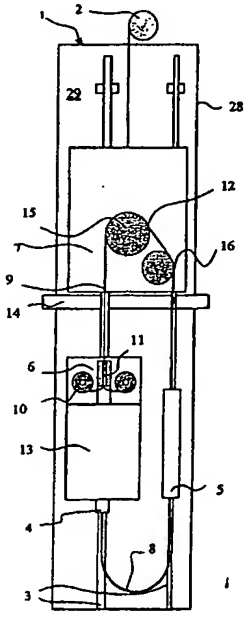
(54) Title: JUMP-LIFT AND METHOD FOR LIFTING A MACHINE ROOM



(57) Abstract: System in construction-time operation of an elevator, said system comprising hoisting ropes, a first and a second element attached to the hoisting ropes and movable in a vertical direction in a hoistway, and a machine room level with an elevator machine disposed on it, characterized in that the first end of the hoisting rope is fastened to the first element and the hoisting rope has been fitted to run from the first element to a traction sheave comprised in the elevator machine and further via a rope clamping device provided on the second element to a rope supply placed on the second element.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

JUMP-LIFT AND METHOD FOR LIFTING A MACHINE ROOM

The present invention relates to a system in construction-time operation of an elevator as defined in the preamble of claim 1 and to a method as defined in the preamble of claim 10 for raising a machine room.

When high-rise buildings are being constructed, elevators are needed before the construction work has been completed. Elevators are either needed for operation during construction or the lower floors are finished earlier than the rest, in which case the elevators serving them have to be available for use. With the progress of construction work, the elevator has to be able to serve as high floors as possible.

For construction-time use, so-called JUMP elevators have been developed, in which the hoisting height of the elevator is increased in a stepwise manner as the construction work is progressing. The elevator machine room is moved to a higher floor and the length of the hoisting rope in use is increased accordingly. It is generally required that the elevator should be available for use in its entirety and with all its properties. Therefore, other components depending on the hoisting height, such as car cables, compensating ropes, overspeed governors and hoistway electrification and hoistway cables should be extended over the entire length of the finished hoistway.

From specification US 5,033,586, an earlier solution is known in which an elevator machine room can be lifted to and fixed at a desired height. This solution comprises another level disposed above the machine room and carrying rope supplies. When the machine room is to be moved, the elevator car is locked so as to immobilize it in relation to the machine room, and the required additional rope length is supplied from the rope

supply. In this solution the rope supply has to be lifted together with the machine room, an extra level has to be built and a complex equipment is required for the supply of additional rope.

The object of the present invention is to achieve an advantageous elevator for use during construction time which can be easily lifted to a higher operation level as the construction work is progressing and which is also applicable for use as a normal elevator in the finished building. To implement this, the system of the invention is characterized by the features presented in the characterization part of claim 1. The method of the invention is characterized by the features presented in claim 10. Other preferred embodiments of the invention are defined in the subclaims.

Using the solution of the invention, the increase of rope length required as the height of the building is increasing is easy to implement. All components of the elevator are always immediately available for use after a move to a new operation level, without requiring any complicated adjustments or settings. The portion of the hoisting rope that is not yet in use is carried along on the car and no external storage space is needed for it. Thus, there is no need to provide for the elevator a temporary storage which would be an impediment to other utilization of the building. The components of the elevator are directly usable as such after the elevator and the building have reached their final height.

According to one characteristic of the invention, in construction-time use of an elevator, the compensating cable of the elevator is of an extendable design, being made of e.g. chain links, in which case an appropriate number of links are added to the compensating cable when the elevator is to be lifted to the next level. If the final speed is higher than the maximum operating

speed of the compensating cable, then the compensating cable of the finished elevator is replaced with compensating ropes, thus allowing the maximum speed of the elevator to be increased to its final value.

According to a characteristic of the invention, the elevator comprises rope supplies of compensating ropes below the car, permitting the elevator to be operated at maximum speed already during construction time.

In the following, the invention will be described in detail by the aid of one of its embodiments with reference to the drawings, wherein

- Fig. 1 presents an elevator according to the invention, and

- Fig. 2 presents another elevator according to the invention.

Fig. 1 is diagrammatic representation of an elevator system, presenting the components significant with respect to the invention while other parts of the elevator are only indicated by reference. Mounted in the upper part of a completed hoistway 1 delimited by side walls 28 and 30 and a back wall 29 is a machine room 7 with an elevator drive machine 12 installed in it. The machine room is supported by supporting elements 14 on the hoistway structures. The drive machine 12 consists of an elevator motor, which may be provided with a gear, and a traction sheave 15 driven by it. The hoisting rope 9 has been arranged to run over the traction sheave and its one end is fastened to the car 13 or car frame. In construction-time operation, the elevator is provided with a rope reel frame 6 disposed on the top of the car 13 and having a number of hoisting rope reels 10 corresponding to the number of hoisting ropes. The hoisting ropes 9 are passed from the rope reels 10

via a locking device 11 up to the traction sheave 15. The clamping of the rope can in principle be implemented using a wedge grip in the same way as is used for fastening the end of the hoisting rope in a permanent installation. A rope clamping means is fixed to the elevator car for use at least during construction time. On one side of the traction sheave 15, the hoisting rope runs over a diverting pulley 16 to the upper part of a counterweight 5, to which it is fastened. The elevator car and counterweight are provided with guides which guide their movement along guide rails 3 mounted in the hoistway. The elevator car and counterweight are suspended using a 1:1 suspension ration, so the circumferential speed of the traction sheave corresponds to the speed of the elevator car and counterweight. Attached in a known manner to the car frame 4 is a compensating cable 8, whose other end is fastened to the lower part of the counterweight 5. For construction-time use, the compensating cable is composed of chain links.

Disposed above the hoistway 1 or on the upper edge of the hoistway is a hoisting apparatus 2 used to move the machine room 7 to the next machine room level after the building and hoistway have reached a corresponding height.

The rope of the overspeed governor is fastened by one end in a known manner to the car and passed over a diverting pulley in the lower part of the hoistway to the wheel of the overspeed governor. The overspeed governor rope is fastened to a clamp on the top of the car and a rope portion is stored in the overspeed governor rope supply on the top of the car. The upwards going rope is fastened to the safety gear activating lever e.g. by means of a lift bar, by means of which the rope clamping is moved to the level of the car top.

Disposed on the machine room level or on another level near it is a space for a control panel and an elevator control unit. If another level is used, then this other level is connected to the machine room level so that both levels can be moved up together as the construction work is progressing. The supply of electricity to the elevator car and the control of the car equipment are implemented in a manner known in itself using a car cable, which is attached to the elevator car 13 and correspondingly to the elevator control unit. In preparation for future hoisting heights, a car cable supply is provided on the machine room level, preferably in the machine room. Similarly, a hoistway cable supply is also provided on the machine room level.

When the machine room of the elevator needs to be moved to the next level, the following procedure will be observed. A hoisting apparatus 2 is brought above the hoistway 1, and guide rails are mounted in the hoistway portion above the machine room and landing doors as well as landing signal devices are installed in the doorways in the upper part. When being lifted, the machine room preferably slides along the car guide rails, guided by sliding guides. Correspondingly, the hoistway cables in the upper part of the hoistway are installed so that they are ready to be connected to the control panel in the machine room. The car is driven onto the buffers, the counterweight being thus brought to a high position, and the counterweight is fastened with a chain to the machine room. The counterweight is preferably fastened by means of e.g. threaded bolts from the machine room. The counterweight is raised a little, whereupon, when the rope clamping device is released, the counterweight will remain at the desired height. The rope clamping device is released, whereupon the additional rope portion can be reeled out from the reels of the rope supply.

The hoistway wiring is detached from the machine room, the clamps of the overspeed governor rope are loosened and a stretch of car cable is reeled out. The compensating cable is disconnected from the car frame connected to the cable on the compensating cable reel. After this, the machine room level is hoisted by means of the hoisting device to the next operation level, a length of hoisting rope corresponding to the hoisting distance being reeled out from the rope reel, whereupon the hoisting rope is fastened with a clamp. During the hoisting operation, the compensating cable is being reeled out. Similarly, the overspeed governor rope is being reeled out from the overspeed governor rope reel on the top of the elevator car. Similarly, lengths of car cable and hoistway cable corresponding to the hoisting distance are released from the car cable and hoistway cable reels on the machine room level.

After the machine room level has been raised to a new height, the supporting means of the machine room are activated and the supported by beams carrying the machine room are fixed in reliable manner to the building. The overspeed governor rope and the hoisting ropes are fastened, tightened to the correct tension and clamped in position. The counterweight is released, the compensating cable is cut off and the cable end is fastened to the bottom of the car, and the car and hoistway cables are connected to the control panel. An amount of mass is removed from the counterweight so that the changed car and rope load is taken into account. After a test run, the elevator is ready to serve the new floors.

Fig. 2 presents another example of an embodiment according to the invention, in which the compensating system is implemented using a compensating rope 30. Where applicable, the same reference numbers as in Fig. 1 are also used in Fig. 2. The compensating ropes are

placed on reels 32 constituting a compensating rope supply, placed under the elevator car. In the car, the compensating ropes are fastened with a clamp 34 placed just below the reels 32. The compensating rope 30 runs around tension weight diverting pulleys 36 and 38 to the counterweight.

In the case illustrated in Fig. 2, the compensating rope is extended by loosening the clamps 34 and reeling out a length of rope 30 corresponding to the hoisting distance. In other respects, the hoisting of the machine room is performed in a manner corresponding to the case illustrated by Fig. 1.

The rope supply for the compensating rope or the compensating cable supply can be placed on the counterweight, in which case the mass of the counterweight will be changed, and so will the mass of the elevator car.

There are numerous different alternatives for implementing the suspension of the car and counterweight during the hoisting of the machine room. Similarly, the hoisting of the machine room and elevator car can be implemented in several alternative ways. For locking the ropes during construction-time use, there are also several methods that can be used in practice. Correspondingly, the supply of rope from the rope supplies can also be implemented using different expedients. The machine room control panels and the elevator control unit may also be placed on the same level with the machine room.

After the building has reached its final height, the construction-time machine room together with the hoisting machine and other machine room equipment can be left permanently in place, so they will constitute a corresponding part of the machine room. The rope sup-

plies and other means used for construction-time purposes are naturally removed as they are now unnecessary.

The above description is not to be regarded as limiting the sphere of patent protection; instead, the embodiments of the invention can be freely varied within the scope defined in the claims.

CLAIMS

1. System in construction-time operation of an elevator, said system comprising hoisting ropes, a first and a second element attached to the hoisting ropes and movable in a vertical direction in a hoistway, and a machine room level with an elevator machine disposed on it, characterized in that the first end of the hoisting rope is fastened to the first element and the hoisting rope has been fitted to run from the first element to a traction sheave comprised in the elevator machine and further via a rope clamping device provided on the second element to a rope supply placed on the second element.

2. System as defined in claim 1, characterized in that the first vertically movable element is an elevator car and the second vertically movable element is a counterweight.

3. System as defined in claim 1, characterized in that the first vertically movable element is a counterweight car and the second vertically movable element is an elevator car.

4. System as defined in any one of claims 1 - 3, characterized in that the system comprises compensating equipment attached to the lower part of the elevator car or car frame and to the counterweight.

5. System as defined in any one of claims 1 - 4, characterized in that it comprises supplies for a car cable, hoistway wiring and an overspeed governor rope.

6. System as defined in any one of claims 1 - 5, characterized in that the control and operating system is disposed substantially in conjunction with the machine room level.

7. System as defined in any one of claims 1 - 6, characterized in that the machine room level can moved upwards by means of hoisting device.

8. System as defined in any one of claims 1 - 7, **characterized** in that, when the building has reached its final height, the machine room level constitutes a machine room or a part of a machine room.

9. System as defined in any one of claims 1 - 8, **characterized** in that the elevator components used for construction-time operation remain in the elevator of the substantially finished building.

10. Method for raising a machine room level in a hoistway, **characterized** in that

- the elevator car is driven onto a buffer,
- the counterweight is fastened to the machine room level,
- the clamps of the hoisting ropes on the car are released
- the machine room level is hoisted to the next level
- the clamps of the hoisting ropes on the car are tightened.

11. Method as defined in claim 10, **characterized** in that additionally the mass of the counterweight is adjusted as appropriate.

12. Method according to claim 1 or 2, **characterized** in that it comprises extending the overspeed governor rope, the car cable and the compensating means and the hoistway cable.

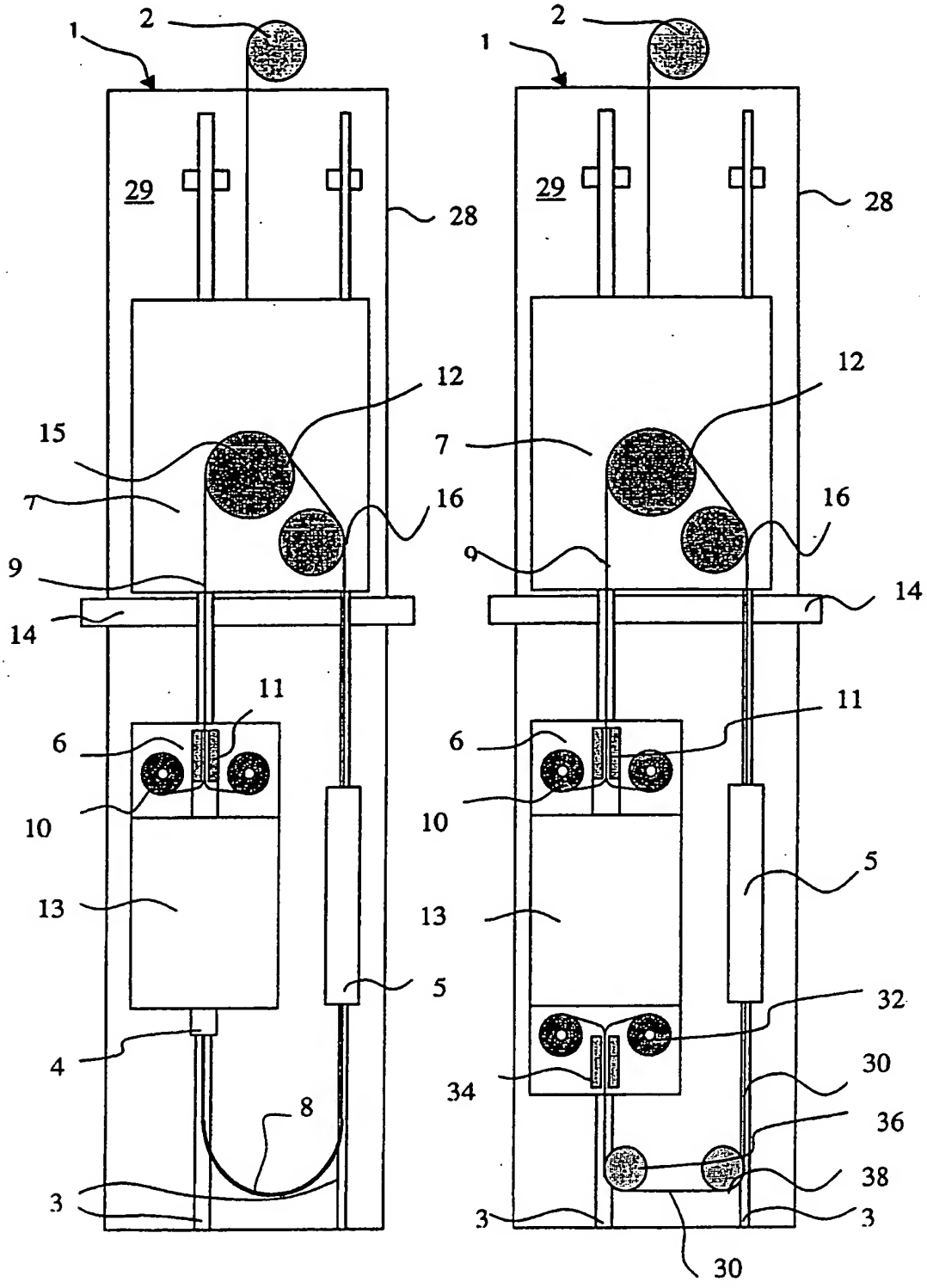
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Fig. 1

Fig. 2

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/FI 01/00219

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B66B9/187 B66B19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B66B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 519 101 A (SIEFFERT JOSEPH EDWARD) 7 July 1970 (1970-07-07) column 2, line 43 - line 68 ---	1,3-12
X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 519 (M-1330), 26 October 1992 (1992-10-26) & JP 04 191276 A (FUJITA CORP), 9 July 1992 (1992-07-09) abstract; figure 1 ---	1,2,7
X	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 02, 30 January 1998 (1998-01-30) & JP 09 278325 A (MITSUBISHI ELECTRIC CORP), 28 October 1997 (1997-10-28) abstract; figure 1 --- -/--	1,2,7

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
3 July 2001	23. 07. 2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Mariana Eddin

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INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/FI 01/00219

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 49 126045 A ((.....) 3 December 1974 (1974-12-03) figure 1 -----	1,3

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INTERNATIONAL SEARCH REPORT

..formation on patent family members

Inter nal Application No
PCT/FI 01/00219

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3519101 A	07-07-1970	DE 1900971 A	04-09-1969
		FR 2000108 A	29-08-1969
		GB 1194618 A	10-06-1970
		JP 50019821 B	10-07-1975
JP 04191276 A	09-07-1992	NONE	
JP 09278325 A	28-10-1997	NONE	
JP 49126045 A	03-12-1974	NONE	